INCLUSIVE SPECTRA OF REACTIONS ^{56}Fe(p,xp),(p,xα)

Alnur Duisebayev, Kairat Ismailov

Institute of Nuclear Physics, National nuclear Center Republic of Kazakhstan

The inclusive spectra of protons and a-particles emitted from proton induced reactions on ^{56} Fe isotopes at Ep=29.9±0.1MeV in angular range 30–135 ° with the step 15° have been measured on isochronous cyclotron U-150M of Institute of Nuclear Physics. Typically, intensities between 40 and 180 nA have been utilised with a beam energy resolution of 0.3%. The self-supporting isotopic enriched (95%) foil of ^{56} Fe with thickness 2.7 mg/cm^2 in these experiments has been used. The standard method of two-detector telescope system (DE-E) registration of secondary particles has been applied. The experimental twice-differential and partial cross-section of the reactions ^{56}Fe(p,xp),(p,xα) were measured.

Basing on exciton model of pre-equilibrium decay have been calculated spectra of multi-step direct (MSD) and compound (MSC) processes for both reactions on ^{56} Fe. This code uses the Griffin exciton model for pre-equilibrium nuclear reactions to describe the emission of particles with mass numbers of 1 to 4 from an equilibrating composite nucleus. A distinction is made between open and closed configurations in this system and between the multi-step direct and multi-step compound components of the pre-equilibrium cross sections. Additional MSD components are calculated semi-empirically to account for direct nucleon transfer reactions and direct knock-out processes involving cluster degrees of freedom. Evaporation from the equilibrated composite nucleus is included in the full MSC cross section. Output of energy differential and double differential cross sections is provided for the first particle emitted from the composite system.

From comparison of experimental and calculated integral spectra it is follows that main contribution in experimental cross section is due to MSD reaction mechanism.

Email: lnps@inp.kz